Taming a Minsky Cycle

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MIT

with Emmanuel Farhi

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Markus Brunnermeier
Extrapolative Expectations & Bubbles

- Extrapolative expectations  (adapted expectations in growth)
  - E.g. Gennaioli & Shleifer book
  - (distorted beliefs)

  ➞ Momentum

  ➞ Bubbles
Good vs. bad bubbles

  - Overcoming QWERTY (chicken-egg) problems

- Safe Asset as a bubble (government debt \( r < g \))
  - Serves as precautionary savings tool
  - Asset Price = \( E[\text{PV(cash flows)}] + E[\text{PV(service flows)}] \)
  - \( 2 \beta_s \)
    - \( \beta^{cf} > 0 \)
    - \( \beta^{sf} < 0 \)

- Real estate bubbles (2006)
- Financial innovation/liberalization bubbles
- BITCOIN

Debt as Safe Asset
Brunnermeier-Merkel-Sannikov 2020
Equity financed bubbles (1998-2000)
Credit financed bubbles (2005-2006)

- Minsky’s financing classification
  - Hedge borrowing: can pay off whole debt
  - Speculative borrowing: can pay off interest due
  - Ponzi financing

1. Policy makers should “fight” bubbles by
   a. Leaning against during build-up
   b. Clean afterwards only

2. Policy makers should “fight” bubbles
   a. with monetary policy
   b. primarily with macro-prudential tools
   c. both
Minsky’s bubble phases

- Displacement phase
- Boom phase
- Euphoria phase
- Profit-taking phase
- Panic phase

Fundamental innovation

Bubble starts

Potential Price path

Fundamental value

$t$
Why do **rational investor ride** rather than attack bubbles?

- Co-opetition among rational investors
  - Competition: exit bubble before it bursts
  - Cooperation: ride as long as other ride it

Sequential awareness/learning + critical mass kills **backwards induction** argument common knowledge of bubble
Poll Questions

1. Policy makers should “fight” bubbles by
   a. Leaning against during build-up
   b. Clean afterwards only

2. Policy makers should “fight” bubbles
   a. with monetary policy
   b. primarily with macro-prudential tools
   c. both

3. Policy makers’ belief distortions and exuberance are
   a. smaller than the markets’
   b. about the same
   c. Larger than the markets’
Taming a Minsky Cycle

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Iván Werning

March 2020
Markus Academy, Princeton
Macroprudential Policy

- Macroprudential policies motivation...
  - financial fragility
  - aggregate demand stabilization
  - monetary policy constraints or dilemmas
- Open economy: capital flows, dilemma

- Farhi-Werning (2013, 2014, 2016)...
  - Applications: capital controls, fiscal unions, deleveraging
  - General model: pecuniary + demand externalities
  - Formula: MPCs + Wedges (Econometrica 2016)

- New Today… “Taming a Minsky Cycle” (2020)
  - Minsky Boom Bust Cycles
    - Boom: complacency, rising asset prices and leverage
    - Bust: “Minsky moment”, risk repricing, deleveraging
  - Non-rational expectations, extrapolation
Macroprudential decisions can lead to macro impact. For example, credit boom, high leverage and risk taking can lead to a low return shock lowering future loans.
Macroprudential regulation

- Financial decisions
  - e.g. credit boom
  - high leverage and risk taking

- Macro impact
  - e.g. low return shock
  - lower future loans
Macroprudential

- Macropru regulation
- Financial decisions
  - e.g. credit boom
  - high leverage and risk taking
- Macro impact
  - e.g. low return shock
  - lower future loans

Is there a market failure?
Not necessarily.
Externality needed.
Macroprudential

- financial decisions
  - e.g. credit boom
  - high leverage and risk taking

- macro impact
  - e.g. low return shock
  - lower future loans

Is there a market failure?
Not necessarily.
Externality needed.

macropru regulation
monetary policy?
Macroprudential decisions

monetary policy? monetary policy?
macropru regulation

financial decisions

e.g. credit boom
e.g. low return shock
high leverage and risk taking
lower future loans

Is there a market failure?
Not necessarily.
Externality needed.
Macroprudential

- financial decisions
- macro impact

\[ \text{tax on asset}_i \text{ held by } j = \sum_{\text{good}} \text{wedge}_{\text{good}} \times \text{MPC}_{\text{good}}^j \]

- Macropru formula: linked to MPCs and wedges
- General model: incomplete markets, financial constraints with prices etc. (pecuniary externalities)
Extrapolative Expectations

- Greenwood-Sheifer (2014): survey of investor expectations of future stock returns correlate with past returns and level of stock market

![Graph showing Gallup Survey Expectations and Past 12m S&P 500 Returns over time from 1997 to 2009. The line graphs are compared and show similar trends, indicating how expectations correlate with past returns.]
Policies to Tame a Minsky Cycle

- Elements today…
  - Monetary with and without macro-pru
  - Macroeconomic vs. financial stabilitys
  - Targets and instruments a la Tinbergen
    - trading off targets with given instruments
    - assignment of targets to instruments
  - Key role of endogeneity of beliefs
Minsky

- Unhappy with neoclassical synthesis;
  - important aspects of Keynes
  - but missing financial/investment
  - too rosy on stability prospects
- Ideas…
  - system is *endogenously* unstable…
  - … perfect stabilization with money and fiscal policy: impossible
  - tranquility, seeds the risk taking, that creates boom/bust
  - financial markets different than real economy; debt financing during expansion, turns more speculative
Minsky in
“Stabilizing an Unstable Economy”

- Boom and role of expectation feedback...
  
  “Instability emerges as a period of relative tranquil growth is transformed into a speculative boom [...] middlemen in finance change in response to the success of the economy.”

  “unless the past is being validated [...] none but pathological optimists will invest.”

  “A rise in the price of financial instruments or capital assets may very well increase the quantity demanded [...] thus breed conditions conductive to another such rise.”

- Policy implications for financial controls...
  
  “We need a Theory that makes instability a normal result in our economy and gives us handles to control it.”

  “External controls and coordinating mechanisms may be needed in a capitalist economy. Indeed, central banking and other financial control devices arose as a response to the embarrassing incoherence of financial markets.”

  “It is possible that with other institutional organizations and policy systems the susceptibility of our economy to financial crises can be lower than at present.”
Related Literature

- Monetary Policy: Woodford, Gali, Werning, Eggertson-Krugman, McKay-Nakamura-Steinsson, Auclert; …
- Monetary Policy and Expectations: Farhi-Werning; Angeletos-Lian; Gabaix…
- Macroprudential Policy: Farhi-Werning, Korinek-Simsek, Caballero-Simsek, Bianchi-Mendoza…
- Extrapolative/Diagnostic Expectations: Bordalo-Gennaioli-Shleifer, Maxted …
Monetary

Rational Expectation

Monetary + Macropru
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Model Ingredients

- He-Krishnamurthy (2013) (Brunnermeier-Sannikov, 2014)
  - asset pricing model
  - adds nominal rigidities + optimal policy
- Incomplete markets...
  - risky asset (Lucas tree)
  - risk-free short-term bond
- Two agents...
  - savers: save risk-free
  - borrowers:
    - invest in risky asset
    - borrow risk-free
- Three periods $t=0,1,2$
- Consumption good produced 1-to-1 with labor
- Rigid wages, no inflation
Demand Determined Output (rigid wage) 

$\begin{align*} 
t &= 0 \\
t &= 1 \\
t &= 2 \\
\end{align*}$

borrowing & investing  \rightarrow  ZLB binds  \rightarrow  risky return realized
Periods, States and Demographics

- Three periods $t \in \{0,1,2\}$
- Aggregate state $\omega \in \{H,L\}$
- Determines dividend $D_{2,\omega}$ of Lucas tree with $D_{2,H} > D_{2,L}$
- Agents $i \in \{S,B\}$ share $\phi^i$
Preferences and Technology

Technology

- \( t = 0,1 \) \[ \phi^S c^S_t + \phi^B c^B_t \leq Y_t = \phi^S l^S_t \]

- \( t = 2 \) \[ \phi^S c^S_{2,\omega} + \phi^B c^B_{2,\omega} \leq Y_{2,\omega} = D_{2,\omega} \]

Preferences

- Borrowers

\[ (1 - \beta_0)[\log c^S_0 - h(l^S_0)] + \beta_0 (1 - \beta_1)[\log c^S_1 - h(l^S_1)] + \beta_0 \beta_1 \mathbb{E}[\log c^S_2] \]

- Savers

\[ (1 - \beta_0) \log c^B_0 + \beta_0 (1 - \beta_1) \log c^B_1 + \beta_0 \beta_1 \mathbb{E}[\log c^B_2] \]
Nominal Rigidities

- Sticky wages normalized to one
- Zero Lower Bound (ZLB) binds at $t=1$, not at $t=0$
Budget Constraints

Savers

\[ c_0^S + \frac{b_1^S}{R_0} - b_0^S - l_0^S - t_0^S \leq 0 \quad \text{with} \quad l_0^S = \frac{Y_0}{\phi^S} \]

\[ c_1^S + \frac{b_2^S}{R_1} - b_1^S - l_1^S \leq 0 \quad \text{with} \quad l_1^S = \frac{Y_1}{\phi^S} \]

\[ c_{2,\omega}^S - b_2^S \leq 0 \]

Borrowers

\[ c_0^B + \frac{b_1^B}{R_0} (1 - \tau_0) - b_0^B + (x_1^B - \frac{1}{\phi_B}) P_0 - t_0^B \leq 0 \]

\[ c_1^B + \frac{b_2^B}{R_1} - b_1^B + (x_2^B - x_1^B) P_1 \leq 0 \]

\[ c_{2,\omega}^B - b_2^B - x_2^B D_{2,\omega} \leq 0 \]
Labor Wedges and Output Gaps

- Labor Wedges
  \[ \mu_t = 1 - c_t^S h'(l_0^S) \]

- Positive wedges iff negative output gap
- "Macroeconomic Stability"
Debt as a State Variable

- Savings of savers $b^S_1$ (debt of borrowers) state variable at $t=1$
- Asset price and output...

$$P_1(b^S_1) = \frac{\beta_1}{1 - \beta_1} Y_1(b^S_1)$$
Debt as a State Variable

- Savings of savers $b_1^S$ (debt of borrowers) state variable at $t=1$
- Asset price and output...

$$P_1(b_1^S) = \frac{\beta_1}{1 - \beta_1} Y_1(b_1^S)$$

- Financial Fragility: two intuitions...
  - higher debt $\rightarrow$ lower risk-taking capacity
    $\rightarrow$ higher risk premia $\rightarrow$ lower asset price
    $\rightarrow$ lower consumption
  - higher debt $\rightarrow$ higher precautionary motive
    $\rightarrow$ lower natural rate $\rightarrow$ lower consumption
- Risk always key here; without it, no effect.
Value Functions and AD Externality

- Allocation pinned down by $b_1^S$
- Value functions $V^S(b_1^S)$ and $V^B(b_1^S)$
- Aggregate demand externality if recession at $t=1$ (compare MRS of planner to agents’)

$$-rac{\chi^S \phi^S dV^S}{\chi^B \phi^B dV^B} = \frac{\chi^S c^B_1}{\chi^B c^S_1} \left(1 + \frac{\mu_1}{\phi^S} \frac{dY_1}{db_1^S}\right) < \frac{\chi^S c^B_1}{\chi^B c^S_1}$$

Externality
Social Marginal Utilities ≠ Private Marginal Utilities
Monetary Policy

- Focus on Pareto weights that neutralize distributive objectives ($\lambda^S/\lambda^B = c_0^S/c_0^B$)

- Optimal monetary policy targeting rule

$$\mu_0 = \left( \frac{\mu_1}{\phi^S} \frac{dY_1}{db_1^S} \right) \left( \frac{\phi^S \frac{db_1^S}{dR_0}}{-R_0 \frac{dY_0}{dR_0}} \right), \quad \text{with} \quad \frac{db_1^S}{dR_0} = \frac{\beta_0 b_0^S}{1 - \frac{\beta_1 (1-\beta_0)}{1-\beta_1} \frac{1}{\phi^S} \frac{dY_1}{db_1^S}}$$

- Lean against boom ($\mu_0 < 0$) iff borrowers initially levered ($b_0^S > 0$)

- Benchmark with $b_0^S = 0$ gives standard “inflation targeting” (IT)
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Monetary Policy and Macropru

- Optimal monetary policy targeting rule
  \[ \mu_0 = 0 \]

- Macroprudential tax on borrower leverage
  \[ 1 - \tau_0 = \left( 1 + \frac{\mu_1}{\phi^S} \frac{dY_1}{db^S_1} \right) \quad \text{or equivalently} \quad \tau_0 = -\frac{\mu_1}{\phi^S} \frac{dY_1}{db^S_1} > 0 \]

- Assignment of targets to instruments:
  - macro stability to monetary policy
  - financial stability to macroprudential policy
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Extrapolative Expectations

- Introduce extrapolative expectations by borrowers

\[ \frac{P_{1}^{e}}{P_{0}} = (1 - \rho) \frac{P_{1}}{P_{0}} + \rho \frac{P_{0}}{P_{-1}} \]

- Modeled by either...
  - wedge in investor Euler equation or
  - subjective probabilities


**AD and Belief Externality**

- AD and Belief Externality

\[
\lambda^S \phi^S \frac{dV^S}{db^S_1} = \lambda^S \frac{c_{1,B,e}^S}{c_{1,B,e}^S} \left( \frac{c_{1,B}^S}{c_{1,B,e}^S} \right) \left( 1 + \frac{\mu_1}{\phi^S} \frac{dY_1}{db^S_1} \right)
\]

- Belief externality reinforces AD externality as long as borrowers optimistic \((c_{1,B,e}^B > c_{1,B}^B)\) in equilibrium

- This will be the case.
Monetary Policy

- Optimal Monetary Policy targeting rule

\[ \mu_0 = \left( \left( \frac{c_1^B}{c_1^{B,e}} \right) \left( 1 + \frac{\mu_1}{\phi^S} \frac{dY_1}{db_1^S} \right) - 1 \right) \left( \frac{(1 - \beta_1) \phi^S c_1^B}{c_1^B} \frac{db_1^S}{dR_0} \right) \]

\[ \frac{db_1^S}{dR_0} = \frac{\beta_0 b_0^S + (1 - \beta_0) \frac{\rho}{\phi^S} \frac{2P_0}{P_{-1}} \frac{\partial P_0}{\partial R_0}}{1 - (1 - \beta_0) \left( \frac{1 - \rho}{\phi^S} \frac{\beta_1}{1 - \beta_1} \frac{dY_1}{db_1^S} + \frac{\rho}{\phi^S} \frac{2P_0}{P_{-1}} \frac{\partial P_0}{\partial b_1^S} \right)} \]

- Lean against boom (\( \mu_0 < 0 \)) if extrapolative expectations
Intuition

• “Take the punch bowl away when the party is still going”

• Contractionary Monetary Policy…
  ■ cools economy during boom
  ■ cools expectations of returns
  ■ cools borrowing
  ■ low borrowing beneficial in future

• Extrapolative expectations important
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Monetary + Macropru

- Optimal monetary policy again...

\[ \mu_0 = 0 \]

- Macropru tax borrower leverage

\[ 1 - \tau_0 = \left( \frac{c_1^B}{c_1^{B,e}} \right) \left( 1 + \frac{\mu_1}{\phi^S} \frac{dY_1}{db^S_1} \right) \]

- Assignment of targets to instruments
  - monetary: macro stability
  - financial stability: macropru
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Extrapolative Expectations During Bust

- Before: only extrapolative during $t = 0$; rationality kicks in at $t = 1$ (“Minsky moment”)
- Now: extrapolative also during bust

- Two state variables…
  - leverage (as before)
  - beliefs affected by past asset prices (new)
- Two-dimensional financial stability
  - monetary policy alone: additional reason to lean against the wind at $t = 0$…
  - …remains true with macropru policy
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Extrapolation during Bust: Lean Against Boom
Conclusion

- General theory of macropru + monetary policy
  - workhorse for many applications
  - general formula: MPCs and wedges

- Minsky Cycles with non-Rational Expectations
  - expectation management: interventions attempt to mitigate financial crashes in prices
  - dilemma: may affect monetary policy
  - modifies optimal policy responses (targets and instruments)